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Computer Programs for Summarizing Climatic Data Stored in the National Fire Weather Data Library

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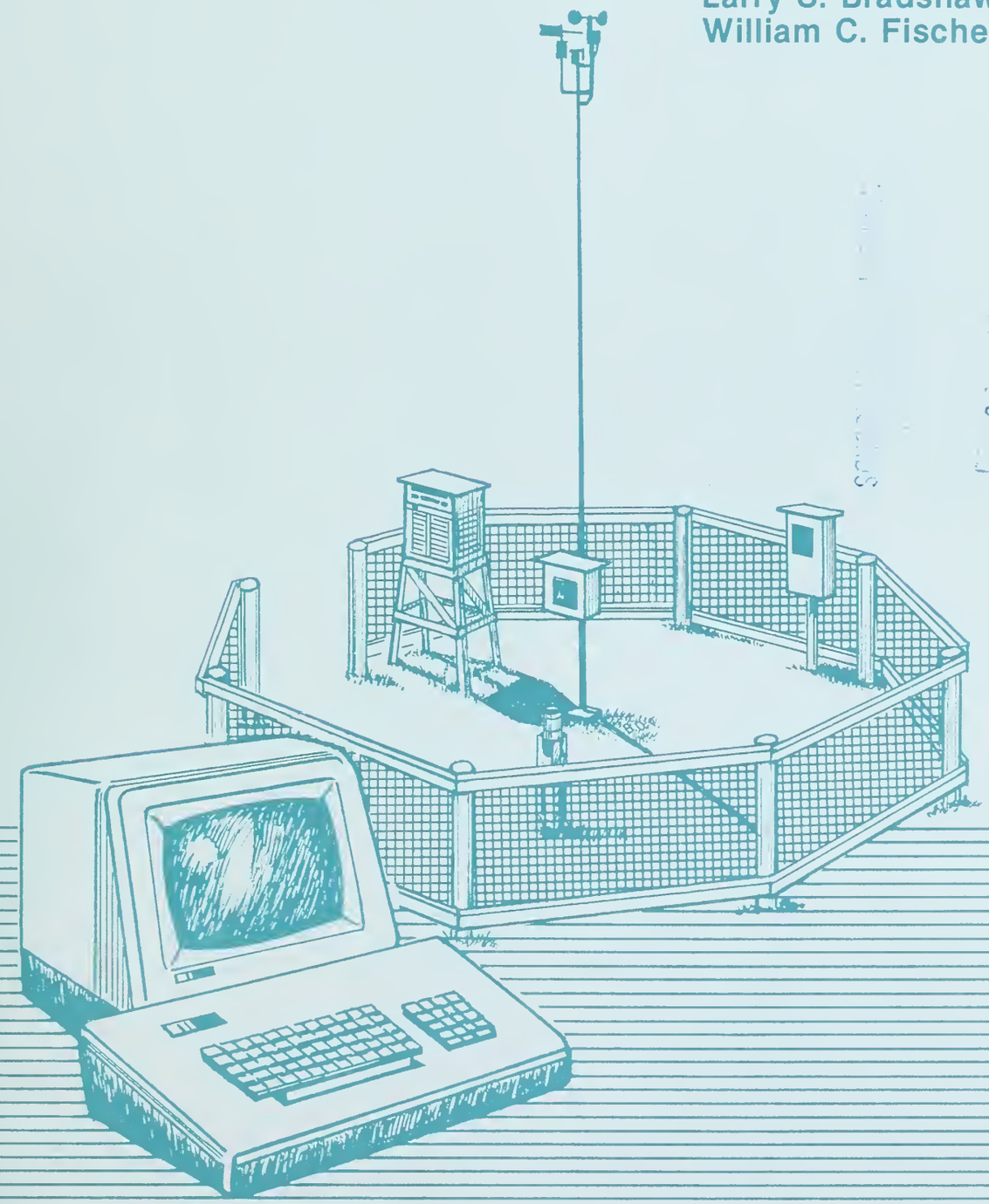

THE AUTHORS

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RESEARCH SUMMARY

This report describes a computer software package that can be used to obtain climatological summaries of temperature, relative humidity, windspeed, and precipitation from the National Fire Weather Data Library. Two types of computer programs are described. Five basic climatology programs analyze National Fire Weather Data Library records by 10-day periods and by month. Three averaging programs adjust results from the climatology programs to smooth variances introduced either by short periods of record or by scant or incomplete station data.

The programs are designed for use in the Fort Collins Computer Center UNIVAC 1100 series computer. The programs are stored in the Forest Service Northern Region shared library at Fort Collins, Colo.

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Computer Programs for Summarizing Climatic Data Stored in the National Fire Weather Data Library

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INTRODUCTION

Local climate affects the timing and conduct of many wildland management activities—for example, tree planting, insect and disease control, road construction and maintenance, timber harvesting, and fire management. Similarly, climatic parameters are important variables in forest and range research studies of fire behavior, smoke dispersal, herbicide and pesticide drift, tree survival and growth, insect population dynamics, plant phenology, wildland hydrology, vegetation classification, and other topics.

A valuable source of climatic data for management planning and research studies in forested and mountainous regions is the National Fire Weather Data Library (NFWDL) (Furman and Brink 1975). The NFWDL is a collection of computerized historical weather data from more than 800 stations monitoring weather once daily (Haines 1977). The library is maintained at the Forest Service, U.S. Department of Agriculture, Computer Center (FCCC) at Fort Collins, Colo. Information includes maximum and minimum daily temperature and relative humidity, dry and wet bulb temperature, windspeed and wind direction, and 24-hour precipitation.

This report describes a series of cost-efficient computer programs that can help managers and scientists summarize data stored in the NFWDL for application in wildland management and research.

GENERAL INFORMATION

The Programs

The climatology software package described herein consists of two types of programs: climatology programs and averaging programs.

Five basic climatology programs analyze NFWDL data by 10-day periods and by month. These programs are SUMMARY, PRECIP1, PRECIP2, WINDS, and THREEWAY.

Three averaging programs, AVERAGE1, AVERAGE2, and AVERAGE3, adjust results from the climatology programs to smooth variances introduced either by short periods of record or by scant or incomplete station data. The averaging programs use long-term, complete data from a nearby station to compute comparative ratios by 10-day and monthly periods. These ratios are weighted and applied to the short or incomplete station record to yield smoothed mean values. The averaging programs are based on the methods described by Finklin (1983).

Location of the Programs

The programs are designed for use on the FCCC UNIVAC 1100 series computer; may be run in either batch or demand mode (132-character terminals only); and are stored in the Forest Service Northern Region shared library, file CSSG*R1LIB., at the FCCC.

Executing the Programs

Program execution is initiated with the @XQT command. The programs are compiled with the level 9R1 ASCII FORTRAN (@FTN) compiler, which contains all the features of FORTRAN standard X3.9-1978. The relocatable elements are mapped into the executable element with the level 22R1 @MAP processor at FCCC. The executable elements are:

```
CSSG*R1LIB.SUMMARY
CSSG*R1LIB.PRECIP1
CSSG*R1LIB.PRECIP2
CSSG*R1LIB.WINDS
CSSG*R1LIB.THREEWAY
CSSG*R1LIB.AVERAGE1
CSSG*R1LIB.AVERAGE2
CSSG*R1LIB.AVERAGE3
```

Users may either enter the entire input stream or use the @ADD capabilities of UNIVAC to initiate job streams.

Creating a Data File

Instructions for obtaining NFWDL data file for analysis are detailed by Furman and Brink (1975). A summary of these instructions is included as appendix A. NFWDL data retrieval software creates a data file directly available for analysis on the UNIVAC 1100 series computer at FCCC.

A user input stream is required for each program in the climatology software package. The input stream assigns the data files, initiates program execution, and

contains program execution instructions. The averaging programs require no external fire weather files, only a user input stream.

Fire weather data is always read from logical unit 15. User input streams are read from logical unit 5, and program output is to unit 6.

THE CLIMATOLOGY PROGRAMS

General Instructions

DATA FILE

Programs PRECIP1, PRECIP2, WINDS, and THREEWAY use similar input streams. Program SUMMARY needs additional parameters. All climatology programs require a data file from the NFWDL. Such a file is designated "WEATHERFILE" in the program execution examples contained in this report. For the purpose of these examples, WEATHERFILE is assummed to be resident on FCCC mass storage. Refer to appendix A or to Furman and Brink (1975) for instructions on how to create a NFWDL data file.

MULTIPLE STATION ANALYSIS

The climatology programs allow analysis of data from two or more stations if the sequence of analysis matches the order that station data occurs on the NFWDL data file. Simply sequence input records in order of ascending station number, for example, 243001, 243002, 243105, 243202, etc.

MULTIPLE PROGRAM EXECUTION

Two or more climatology programs may be executed under a single @RUN record. Signify the end of a current input stream by a @EOF record and follow with another @XQT record and its associated user input stream.

MULTIPLE PARAMETERS

Multiple parameters may be analyzed when using program SUMMARY. Simply include input records to specify the parameters to be summarized.

DATA BASE COMPOSITION

Each climatology program displays data presence by year and by 10-day period, thus the program user sees the extent of the data base used in the analysis. Data gaps are easily identified. This information is important for evaluating the reliability of climatology program output and deciding whether to employ the averaging programs to improve reliability.

PROGRAM LIMITATIONS

Program THREEWAY is the only climatology program that has a limitation in its execution. Only 5 months of data can be analyzed in a single pass with Program THREEWAY. If more than 5 months of station data needs to be analyzed, simply prepare two (or three) input records for the station. Make sure all the desired months are entered on the input records. The input may be in any order.

Program SUMMARY

FUNCTION

Program SUMMARY generates one to five different climatological summary tables for any of the following weather elements:

dry bulb temperature (degrees F; observation time)
maximum temperature (degrees F; 24-hour period)
minimum temperature (degrees F; 24-hour period)
mean daily temperature (degrees F; max. plus min./2)
relative humidity (percent; observation time)
maximum relative humidity (percent; 24-hour period)
minimum relative humidity (percent; 24-hour period)
mean daily relative humidity (percent; max. plus min./2)

OUTPUT

The first page of output for each station analyzed contains an input record image and data count by years and 10-day periods (exhibit 1). Climatological summaries are printed in table form. Five table formats are available from program SUMMARY, each stratified by 10-day period and by month. A single page of output is produced for each table format selected (per weather element per station).

The tables produced and their formats are:

Table 1 (exhibit 2)
Mean, standard deviation, median, highest period average and year of occurrence, lowest period average and year of occurrence, period high and low values and the years they occurred, and the mean, standard deviation, and median value for period high and low values for their respective years of occurrence.

Table 2 (exhibit 3)
Frequency distributions (percentage) of daily values in selected class intervals.

Table 3 (exhibit 4)
Frequency distributions (percentage of period maximum values in selected class intervals.

Table 4 (exhibit 5)
Frequency distributions (percentage) of period minimum values in selected class intervals.

Table 5 (exhibit 6)
Number of days selected benchmark values are surpassed.

Users may specify the minimum number (from 1 to 10) of weather observations per 10-day period to allow the period to be included in the analysis. The default minimum is 6 days per 10- (or 11-) day period. That is, at most, four observations may be missing in a 10-day (five in an 11-day) period. If more observations are missing, the period is rejected from the sample.

For the lowest and highest period average and year of occurrence, if the average is based on a period with missing days (at least the minimum number as described above, but less than 10 [or 11]), the period is flagged with an "M".

INPUT

One input record is required for each weather element for each weather station. Input formats for program SUMMARY are specified in exhibit 7.

EXECUTION

The following FCCC runstream will produce the output exemplified in exhibits 1 through 6 (see exhibit 7 for proper column assignment of input in item 6 below):

```
@RUN,P RUNID,ACCOUNT,QUALIFIER,60,1000
@ASG,A WEATHERFILE.
@USE 15.,WEATHERFILE.
@ASG,A CSSG*R1LIB.
@XQT CSSG*R1LIB.SUMMARY
DRY BULB TEMPERATURE      240217HUNGRY HORSE R.S.    3225. 12345051158103182
@EOF
@FIN
```

COST

Program SUMMARY costs about 15 cents to run for one weather element for one station. This estimate is based on analysis of a station with 1,900 observation days run on an overnight priority (priority P).

IMAGE OF INPUT RECORD 1

TABLE PARAMETER	NUMBER	NAME	ELEVATION	TABLES	BEGIN	END	MIN DAYS
DRY BULB TEMPERATURE	240217	HUNGRY HORSE R.S.	3225.	1 2 3 4 5	51154	103182	6

PROGRAM SUMMARY

DATA COUNT BY YEARS AND 10-DAY PERIODS

PERIOD BEGINS	YEARS HAVING DATA FOR EACH PERIOD	TOTAL NUM YEARS
MAY 11	58 59 63 64 65 66 67 68 69 70 71 72 73 75 76 77 78 79 80 81	20
MAY 21	58 59 62 63 64 65 66 67 68 69 70 71 72 73 75 76 77 78 79 80 81	21
JUN 1	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
JUN 11	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
JUN 21	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
JUL 1	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
JUL 11	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
JUL 21	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
AUG 1	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
AUG 11	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
AUG 21	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
SEP 1	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
SEP 11	58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
SEP 21	58 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	23
OCT 1	60 63 64 65 66 67 69 70 72 73 74 75 79	13
OCT 11	60 63 64 65 66 67 69 70 72 73 74 79	12
OCT 21	63 64 65 66 67 69 70 72 73 74	10

Exhibit 1.—Sample first page output from program SUMMARY. This page shows image of input record and a data count. Input record reflects a request for a summary of dry bulb temperature using table formats 1, 2, 3, 4, and 5 for NFWDL data from Hungry Horse Ranger Station, Mont., for the period 5/11/58 through 10/31/82. Data count indicates that 1982 data have not been incorporated into NFWDL.

DRY BULB TEMPERATURE

MEAN, STANDARD DEVIATION, AND EXTREME VALUES

STATION NUMBER 240217 HUNGRY HORSE R.S. 1958-1981

		10-DAY AND MONTHLY PERIOD MEANS						10-DAY AND MONTHLY EXTREME DAILY VALUES							
PRD. BEGINS	NO. YRS	MEAN	STD. DEV.	MEDIAN	HIGHEST AVG.YR	LOWEST AVG.YR	I	HIGH.YR	AVG. HIGH	STD. DEV.	MEDIAN HIGH	LOW.YR	AVG. LOW	STD. DEV.	MEDIAN LOW	PRD BEGI
MAY 11	20	61.3	5.9	61.0	72.6 73	52.7 66	I	83 73	74.3	4.8	74.0	38 67	46.6	7.4	45.5	MAY
MAY 21	20	62.3	7.3	61.5	79.8 58	51.0 78	I	86 66	76.1	6.5	77.0	31 78	47.9	8.4	47.0	MAY
JUN 1	24	65.7	6.1	64.5	77.7 72	57.6 80	I	87 70	76.4	6.8	77.0	40 80	53.0	7.7	52.0	JUN
JUN 11	24	67.5	6.5	65.5	81.3 61	57.1 81	I	93 61	79.5	6.7	79.0	43 65	53.5	6.7	52.0	JUN
JUN 21	24	69.3	6.3	68.5	80.8 61	56.5 69	I	89 70	81.0	5.3	81.5	44 76	54.7	8.1	53.0	JUN
JUL 1	24	74.1	5.8	71.5	84.6 68	65.5 71	I	97 73	84.4	6.1	83.5	48 71	60.7	7.1	59.5	JUL
JUL 11	24	76.7	7.0	76.0	94.1 60	64.6 80	I	101 60	86.8	6.1	87.5	51 77	63.4	10.1	60.0	JUL
JUL 21	24	79.9	4.6	80.5	88.5 60	71.0 81	I	96 60	88.4	3.9	89.0	57 63	66.8	6.9	64.5	JUL
AUG 1	24	79.3	6.0	81.0	89.2 71	69.5 80	I	103 61	88.4	5.8	89.0	55 74	65.6	7.8	65.0	AUG
AUG 11	24	76.7	8.3	78.0	94.5 67	62.5 78	I	97 67	86.4	6.0	87.0	50 66	64.9	11.2	63.5	AUG
AUG 21	24	71.6	7.9	72.0	83.8 67	58.7 75	I	100 69	84.2	8.1	83.0	47 77	57.7	7.4	57.0	AUG
SEP 1	24	68.1	6.4	66.0	82.7 67	58.4 64	I	97 67	80.2	7.2	79.5	43 62	53.3	6.8	51.5	SEP
SEP 11	24	63.2	7.0	63.0	74.2 60	45.0 65	I	92 58	75.0	9.2	76.5	36 65	50.0	7.0	50.0	SEP
SEP 21	23	60.4	7.9	60.0	76.9 67	48.4 77	I	87 67	69.8	7.6	70.0	38 72	49.7	8.0	49.0	SEP
OCT 1	12	57.2	5.3	57.5	64.6 60	47.7 69	I	77 70	68.8	6.7	70.5	30 72	45.1	8.1	49.5	OCT
OCT 11	10	50.9	5.9	50.5	60.7 74	44.1 72	I	68 73	59.7	4.9	59.5	35 66	43.6	6.8	44.0	OCT
OCT 21	10	45.6	5.4	45.5	55.5 74	37.3 70	I	63 69	55.4	6.1	57.0	30 72	36.1	4.7	35.5	OCT
MONTH							I									MON
JUN	24	67.5	4.1	67.0	78.7 61	60.7 81	I	93 61	84.1	3.9	84.5	40 80	48.2	5.2	47.5	J
JUL	24	77.0	4.3	76.0	88.7 60	70.0 77	I	101 60	90.2	4.2	90.5	48 71	57.9	6.1	57.0	J
AUG	24	75.7	6.3	74.5	87.2 67	66.1 75	I	103 61	90.5	5.9	91.0	47 77	54.7	4.4	55.0	A
SEP	24	64.0	5.6	63.0	77.4 67	52.9 65	I	97 67	81.1	6.8	80.5	36 65	46.2	6.1	44.5	S
OCT	10	50.7	4.1	50.5	57.1 74	45.7 69	M I	77 70	69.1	5.0	68.5	30 72	34.9	3.4	35.0	O

Exhibit 2.—Sample program SUMMARY output showing dry bulb temperature summarized according to table 1 format: means, standard deviations and extremes. Data are from Hungry Horse Ranger Station, Mont., for the period 1958-81.

DRY BULB TEMPERATURE

PERCENTAGE FREQUENCY DISTRIBUTION OF DAILY VALUES
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 240217 HUNGRY HORSE R.S. 1958-1981

	TEMPERATURE VALUES																						
PRD. BEGINS	BELOW 0	0 TO 4	5 TO 9	10 TO 14	15 TO 19	20 TO 24	25 TO 29	30 TO 34	35 TO 39	40 TO 44	45 TO 49	50 TO 54	55 TO 59	60 TO 64	65 TO 69	70 TO 74	75 TO 79	80 TO 84	85 TO 89	90 TO 94	95 TO 99	100 AND ABOVE	PRD. BEGINS
MAY 11									25	40	121	90	146	141	191	131	90	25					MAY 11
MAY 21								5	5	41	69	124	175	143	129	143	92	55	18				MAY 21
JUN 1										13	29	84	146	184	192	146	130	54	21				JUN 1
JUN 11										4	21	83	146	163	138	183	125	83	46	8			JUN 11
JUN 21										8	46	67	71	138	142	179	146	133	71				JUN 21
JUL 1											4	8	58	108	138	188	171	192	104	25	4		JUL 1
JUL 11												8	58	63	100	163	192	158	167	75	13	4	JUL 11
JUL 21													15	61	30	117	197	250	246	72	11		JUL 21
AUG 1													29	38	96	138	142	225	183	129	13	8	AUG 1
AUG 11												25	58	71	96	121	179	175	183	67	25		AUG 11
AUG 21											11	61	106	125	125	163	155	117	64	64	4	4	AUG 21
SEP 1										8	33	88	96	150	150	192	108	96	67	8	4		SEP 1
SEP 11									8	42	21	184	130	151	167	126	109	54	4	4			SEP 11
SEP 21									9	72	67	135	175	161	193	103	67	9	9				SEP 21
OCT 1								16	24	40	105	177	234	194	89	89	32						OCT 1
OCT 11									76	133	257	200	152	143	38								OCT 11
OCT 21								126	117	204	233	155	117	49									OCT 21
MONTH																							MONTH
JUN										8	32	78	121	161	157	170	134	90	46	3			JUN
JUL											1	5	43	77	87	155	187	202	175	58	9	1	JUL
AUG											4	30	66	79	106	141	159	171	141	86	13	4	AUG
SEP									6	40	40	135	132	154	170	141	95	54	27	4	1		SEP
OCT								45	69	120	193	178	172	133	45	33	12						OCT

Exhibit 3.—Sample program SUMMARY output showing dry bulb temperature summarized according to table 2 format: frequency distribution of daily values. Data are from Hungry Horse Ranger Station, Mont., for the period 1958-81.

DRY BULB TEMPERATURE

PERCENTAGE FREQUENCY DISTRIBUTION OF PERIOD MAXIMUMS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 240217 HUNGRY HORSE R.S. 1958-1981

TEMPERATURE VALUES

PRD. BEGINS	BELOW 0	0 TO 4	5 TO 9	10 TO 14	15 TO 19	20 TO 24	25 TO 29	30 TO 34	35 TO 39	40 TO 44	45 TO 49	50 TO 54	55 TO 59	60 TO 64	65 TO 69	70 TO 74	75 TO 79	80 TO 84	85 TO 89	90 TO 94	95 TO 99	100 AND ABOVE	PRD. BEGINS
MAY 11															100	450	350	100					MAY 11
MAY 21														50	50	250	350	200	100				MAY 21
JUN 1														42	167	208	250	167	167				JUN 1
JUN 11														42		83	417	250	167	42			JUN 11
JUN 21															42	83	125	458	292				JUN 21
JUL 1																42	167	333	208	208	42		JUL 1
JUL 11																42	83	208	333	292		42	JUL 11
JUL 21																		167	375	375	83		JUL 21
AUG 1																	42	208	250	417	42	42	AUG 1
AUG 11																	250	125	333	167	125		AUG 11
AUG 21																125	208	208	42	375		42	AUG 21
SEP 1															42	250	208	250	167	42	42		SEP 1
SEP 11												42		83	125	208	167	292	42	42			SEP 11
SEP 21													87	87	304	304	130	43	43				SEP 21
OCT 1													83	250	167	250	250						OCT 1
OCT 11												200	300	300	200								OCT 11
OCT 21										100		300	300	300									OCT 21
MONTH																							MONTH
JUN																	125	375	458	42			JUN
JUL																		125	208	542	83	42	JUL
AUG																	42	125	167	458	125	83	AUG
SEP																250	167	333	167	42	42		SEP
OCT														200	400	300	100						OCT

Exhibit 4.—Sample program SUMMARY output showing dry bulb temperature summarized according to table 3 format: frequency distribution of period maximums. Data are from Hungry Horse Ranger Station, Mont., for the period 1958-81.

DRY BULB TEMPERATURE

PERCENTAGE FREQUENCY DISTRIBUTION OF PERIOD MINIMUMS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 240217 HUNGRY HORSE R.S. 1958-1981

TEMPERATURE VALUES

PRD. BEGINS	BELOW 0	0 TO 4	5 TO 9	10 TO 14	15 TO 19	20 TO 24	25 TO 29	30 TO 34	35 TO 39	40 TO 44	45 TO 49	50 TO 54	55 TO 59	60 TO 64	65 TO 69	70 TO 74	75 TO 79	80 TO 84	85 TO 89	90 TO 94	95 TO 99	100 AND ABOVE	PRD. BEGINS
MAY 11									250	200	250	50	200	50									MAY 11
MAY 21								50	50	300	200	100	250		50								MAY 21
JUN 1										125	208	292	167	83	125								JUN 1
JUN 11										42	208	375	167	125	83								JUN 11
JUN 21										83	250	250	125	125	125	42							JUN 21
JUL 1											42	83	375	250	42	167	42						JUL 1
JUL 11												83	375	208	125		125	42	42				JUL 11
JUL 21													125	375	83	208	208						JUL 21
AUG 1													292	167	167	208	125	42					AUG 1
AUG 11												208	208	83	125	125	125	83		42			AUG 11
AUG 21											125	250	292	167	83	42	42						AUG 21
SEP 1										42	333	250	292			83							SEP 1
SEP 11									42	208	167	375	125	42	42								SEP 11
SEP 21									87	304	130	130	174	174									SEP 21
OCT 1								167	83	167	83	500											OCT 1
OCT 11									400	100	300	200											OCT 11
OCT 21								400	400	100	100												OCT 21
MONTH																							MONTH
JUN										250	458	167	83	42									JUN
JUL											42	167	458	250		42	42						JUL
AUG											125	333	375	167									AUG
SEP									83	417	167	208	83	42									SEP
OCT								400	500	100													OCT

Exhibit 5.—Sample program SUMMARY output showing dry bulb temperature summarized according to table 4 format: frequency distribution of period minimums. Data are from Hungry Horse Ranger Station, Mont., for the period 1958-81.

DRY BULB TEMPERATURE

NUMBER OF DAYS SELECTED VALUE SURPASSED

STATION NUMBER 240217 HUNGRY HORSE R.S. 1958-1981

PRD. BEGINS	NUMBER OF DAYS LESS THAN OR EQUAL TO VALUE < 32 F	< 42 F	< 52 F	< 62 F	I	NUMBER OF DAYS GREATER THAN OR EQUAL TO VALUE > 60 F	> 70 F	> 80 F	> 90 F	>100 F	PRD. BEGINS
MAY 11		9	46	102	I	115	49	5			MAY 11
MAY 21	1	6	46	113	I	126	67	16			MAY 21
JUN 1		2	23	86	I	174	84	18			JUN 1
JUN 11			16	86	I	179	107	33	2		JUN 11
JUN 21			21	64	I	194	127	49			JUN 21
JUL 1			3	35	I	223	164	78	7		JUL 1
JUL 11			1	29	I	224	185	100	22	1	JUL 11
JUL 21				12	I	260	236	153	22		JUL 21
AUG 1				13	I	233	201	134	36	2	AUG 1
AUG 11			3	31	I	220	180	108	22		AUG 11
AUG 21			12	66	I	217	151	67	19	1	AUG 21
SEP 1			21	77	I	186	114	42	3		SEP 1
SEP 11		8	38	117	I	147	71	15	1		SEP 11
SEP 21		11	52	126	I	121	42	4			SEP 21
OCT 1	2	8	36	89	I	50	15				OCT 1
OCT 11		16	61	98	I	19					OCT 11
OCT 21	6	38	79	102	I	5					OCT 21
MONTH					I						MONTH
JUN		2	60	236	I	547	318	100	2		JUN
JUL			4	76	I	707	585	331	51	1	JUL
AUG			15	110	I	670	532	309	77	3	AUG
SEP		19	111	320	I	454	227	61	4		SEP
OCT	8	62	176	289	I	74	15				OCT

@FIN

Exhibit 6.—Sample program SUMMARY output showing dry bulb temperature summarized according to table 5 format: number of days selected values were surpassed. Data are from Hungry Horse Ranger Station, Mont., for the period 1958-81.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function
	D	Duplicate
	P	Punch
	S	Skip
	V	Verify
	L	Left justify

PROGRAM NAME: SEM*CLIM.SUMMARY

PROGRAM NUMBER | DATE: 12/81

SOURCE DOCUMENT RECORD FORM USE

PREPARED BY: Larry Bradshaw | PAGE: 1 of 1

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
Parameter to be summarized	1	25	25	P/L	Enter parameter exactly as spelled below, left justified!
DRY BULB TEMPERATURE					RELATIVE HUMIDITY
MAXIMUM DAILY TEMPERATURE					MAXIMUM RELATIVE HUMIDITY
MINIMUM DAILY TEMPERATURE					MINIMUM RELATIVE HUMIDITY
MEAN DAILY TEMPERATURE					MEAN RELATIVE HUMIDITY
STATION NUMBER	26	31	6	P	AFFIRMS STATION NUMBER (I6)
STATION NAME	32	51	20	P	AFFIRMS STATION NAME (5A4)
STATION ELEVATION	52	57	6	P	(F6.0, right justified)
TABLE OUTPUT OPTIONS	58	62	5	P	Enter table(s) requested.
Entries are positional--table 1 = column 58, table 5 = column 62. If a table is requested, enter the number in the correct column. If not, leave the column blank, or enter a zero.					
DATE TO BEGIN ANALYSIS	63	68	6	P	Enter date (MMDDYY)
DATE TO END ANALYSIS	69	74	6	P	Enter date (MMDDYY)
MINIMUM DAYS/10-DAY PERIOD	76	77	2	P	Right justified 06 as default (may be blank)

Exhibit 7.—Input format specifications for program SUMMARY.

Program PRECIP1

FUNCTION

Program PRECIP1 generates two frequency distribution tables for precipitation; one for daily amounts and another for period amounts.

OUTPUT

Two tables are produced for each station analyzed by program PRECIP1, each stratified by 10-day periods and by month. The first page of output for each station analyzed contains the input record image and the data count by years and 10-day periods (exhibit 8). The tables produced are:

Table 1 (exhibit 9)

Percentage frequency distribution of daily precipitation amounts in selected class intervals.

Table 2 (exhibit 10)

Percentage frequency distribution of period total precipitation amounts in selected class intervals.

INPUT

One input record is required for each weather station to be summarized. Input formats for program PRECIP1 are specified in exhibit 11.

EXECUTION

The following FCCC control sequence will run PRECIP1 on data file "WEATHERFILE" (which is assumed to already exist on FCCC mass storage) and produce the output displayed as exhibits 8, 9, and 10 (see exhibit 11 for proper column assignment of input in item 6 below):

```
@RUN,P RUNID,ACCOUNT,QUALIFIER,60,1000
@ASG,A WEATHERFILE.
@USE 15.,WEATHERFILE.
@ASG,A CSSG*R1LIB.
@XQT CSSG*R1LIB.PRECIP1
      245201FORT HOWES R.S.    3200.  051154101182
@EOF
@FIN
```

COST

Program PRECIP1 costs about 10 cents to run on an overnight priority (priority P) for a 1,900-observation-day station.

IMAGE OF INPUT RECORD 1

NUMBER	NAME	ELEVATION	BEGIN	END
245201	FORT HOWES R.S.	3200.	51154	101182

PROGRAM PRECIP1

DATA COUNT BY YEARS AND 10-DAY PERIODS

PERIOD BEGINS	YEARS HAVING DATA FOR EACH PERIOD	TOTAL NUM YEARS
MAY 11	57 58 59 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	24
MAY 21	56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	26
JUN 1	54 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
JUN 11	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUN 21	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 1	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 11	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 21	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
AUG 1	54 55 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
AUG 11	54 55 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
AUG 21	54 55 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
SEP 1	54 55 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
SEP 11	54 55 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
SEP 21	54 56 57 58 59 60 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	26
OCT 1	56 57 58 60 62 63 64 65 66 67 68 69 70 78 79	15

Exhibit 8.—Sample first page output from program PRECIP1. This page shows image of input record and a data count. Input record reflects a request for PRECIP1 summaries for NFWDL data from Fort Howes Ranger Station, Mont., for the period 5/11/54 through 10/11/82. Data count indicates that 1982 data are not yet incorporated into NFWDL.

TABLE-XVI> PRECIPITATION - PERCENT FREQUENCY OF DAILY AMOUNTS (INCHES)

- GIVEN TO NEAREST TENTH PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 245201 FORT HOWES R.S. 1954-1981

PERIOD BEGINS	TOTAL NUM. DAYS	AMOUNT EQUAL TO OR GREATER THAN TR	.01	.05	.10	.20	.30	.40	.50	.60	.80	1.00	1.50	2.00	3.00	4.0
MAY 11	236	25	301	242	195	136	97	76	64	38	25	13	8			
MAY 21	263	38	388	304	259	186	125	106	84	57	23	8	8			
JUN 1	270	26	407	333	256	144	96	89	70	52	30	22	4			
JUN 11	269	19	394	301	268	171	119	100	63	56	37	19	7	4		
JUN 21	264	4	284	212	155	102	76	49	30	15	8	4				
JUL 1	274	33	186	128	84	47	29	18	15	11	7	7	7			
JUL 11	272	29	239	173	107	77	55	40	26	18	4					
JUL 21	300	17	247	170	113	60	40	30	20	17	3					
AUG 1	261	23	153	107	77	50	31	19	15	8	4					
AUG 11	263	19	224	144	110	61	27	19	8	8	8					
AUG 21	289	14	211	152	118	76	55	45	35	28	14	10	3			
SEP 1	258	8	155	128	81	47	39	23	19	19	16	4	4			
SEP 11	259	23	220	170	135	73	62	42	31	27	23	15	8	8		
SEP 21	238	8	185	134	101	59	34	8	8	4						
OCT 1	132	15	159	106	76	45	23	8								
MONTH																
JUN	803	16	362	283	227	139	97	80	55	41	25	15	4	1		
JUL	846	26	225	157	102	61	41	30	20	15	5	2	2			
AUG	813	18	197	135	102	63	38	28	20	15	9	4	1			
SEP	755	13	187	144	106	60	45	25	20	17	13	7	4	3		

Exhibit 9.—Sample program PRECIP1 summary of precipitation according to table 1 format: percentage frequency distribution of daily amounts. Data are from Fort Howes Ranger Station, Mont., for the period 1954-81.

TABLE-XVI A> PRECIPITATION - PERCENT FREQUENCY OF PERIOD TOTALS (INCHES)

- GIVEN TO NEAREST TENTH PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 245201 FORT HOWES R.S. 1954-1981

PERIOD BEGINS	TOTAL NUM. YEARS	AMOUNT EQUAL TO OR GREATER THAN													
		TR	.01	.05	.10	.20	.30	.40	.50	.60	.80	1.00	1.50	2.00	3.00	4.0
MAY 11	24		833	833	833	792	667	625	583	417	375	375	167	83	42	4
MAY 21	26		962	962	923	923	885	769	769	731	615	500	192	154		
JUN 1	27	37	963	889	852	852	778	778	667	667	630	556	296	74		
JUN 11	28		964	929	929	893	857	821	821	714	607	464	250	179	36	
JUN 21	28		893	857	786	643	607	464	357	357	250	179	71	36		
JUL 1	28		821	786	679	464	321	214	214	143	143	71	71	36		
JUL 11	28	36	857	750	714	571	536	464	321	250	179	107				
JUL 21	28		857	821	821	536	429	321	214	179	143	107	36	36		
AUG 1	27	111	778	630	519	407	333	259	259	185	74	37				
AUG 11	27		889	778	630	444	333	333	259	185	148	111				
AUG 21	27	74	852	815	741	593	519	444	407	259	185	111	111	74		
SEP 1	27	37	741	630	519	370	333	259	222	222	185	111	74	37		
SEP 11	27	111	778	667	630	519	444	370	296	259	185	111	111	111	37	3
SEP 21	26		923	769	654	500	423	192	115	38	38	38				
OCT 1	15	67	733	600	600	467	333	133								
MONTH																
JUN	28		1000	1000	1000	1000	1000	1000	1000	1000	964	929	786	643	357	10
JUL	28		1000	1000	964	857	857	821	786	679	500	464	321	214	36	
AUG	27		1000	963	926	926	889	852	741	630	444	370	222	185	74	3
SEP	27	37	963	963	926	852	741	704	667	630	556	481	296	185	111	7

Exhibit 10.—Sample program PRECIP1 summary of precipitation according to table 2 format: percentage frequency distribution of period totals. Data are from Fort Howes Ranger Station, Mont., for the period 1954-81.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function
	D	Duplicate
	P	Punch
	S	Skip
	V	Verify
	L	Left justify

PROGRAM NAME
PRECIP1/PRECIP2/WINDS/THREEWAY[1]

PROGRAM NUMBER	DATE
	8/1/79

SOURCE DOCUMENT RECORD FORM USE

PREPARED BY	PAGE
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RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
Blank field	1	5	5	S	Leave blank
Station number	6	11	6	P	AFFIRMS Station Number (I6)
Station name	12	31	20	P	Punch station name up to 20 characters - Format (5A4)
Station elevation	32	41	10	P	Format (F10.0) decimal punched unless right justified
Date to begin analysis	42	45	4	P	Enter month and day (MMDD)
Year to begin analysis	46	47	2	P	Enter year (YY)
Date to end analysis	48	51	4	P	Enter month and day (MMDD)
Year to end analysis	52	53	2	P	Enter year (YY)
Output specification[2]	55	55	1	P	0 = 10-day & monthly (default) 1 = monthly only
Minimum days/10-day[3]	57	58	2	P	Right justify, 08 is default may be blank

[1] The same input record may be used for all four programs. Only the needed fields are read.
[2] For WINDS and THREEWAY only.
[3] For PRECIP2 only.

Exhibit 11.—Input format specifications for programs PRECIP1, PRECIP2, WINDS, and THREEWAY.

Program PRECIP2

FUNCTION

Program PRECIP2 summarizes and displays average and extreme daily, 10-day period, and monthly precipitation.

OUTPUT

Output from program PRECIP2 consists of the one-page input record image and data count for each station analyzed (exhibit 12) and a one-page summary table containing the following information for each station analyzed (exhibit 13):

- mean period precipitation (and standard deviation)
- median period precipitation
- highest period precipitation and year of occurrence
- lowest period precipitation and year of occurrence
- average daily maximum precipitation (and standard deviation)
- median daily precipitation
- highest daily precipitation and year of occurrence

Users may specify the minimum number (from 1 to 10) of weather observations per 10- (or 11-) day period to allow the period to be included in the analysis. The default minimum is 8 days per 10- (or 11-) day period.

For the lowest and highest period totals and year of occurrence, if the period is less than complete (at least the minimum, but less than 10 [or 11]), the period is flagged with an "M".

INPUT

Input requirements for program PRECIP2 are as described for program PRECIP1 (exhibit 11).

EXECUTION

The following FCCC control stream will generate the output displayed in exhibits 12 and 13 using the weather file "WEATHERFILE" (see exhibit 11 for proper column assignment of input in item 6 below):

```
@RUN,P  RUNID,ACCOUNT,QUALIFIER,60,1000
@ASG,A WEATHERFILE.
@USE  15.,WEATHERFILE.
@ASG,A  CSSG*R1LIB.
@XQT  CSSG*R1LIB.PRECIP2
      101033RIGGINS  R.S.          1840.       051154101182
@EOF
@FIN
```

COST

A overnight run (priority P) of program PRECIP2 for a 1,900- observation-day station will cost about 15 cents.

IMAGE OF INPUT RECORD 1

NUMBER	NAME	ELEVATION	BEGIN	END	MIN DAYS
101033	RIGGINS R.S.	1840.	51154	101182	8

PROGRAM PRECIP2

DATA COUNT BY YEARS AND 10-DAY PERIODS

PERIOD BEGINS	YEARS HAVING DATA FOR EACH PERIOD	TOTAL NUM YEARS
MAY 11	61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	21
MAY 21	61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	21
JUN 1	54 55 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	27
JUN 11	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUN 21	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 1	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 11	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
JUL 21	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
AUG 1	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
AUG 11	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
AUG 21	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
SEP 1	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	28
SEP 11	54 55 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 74 75 76 77 78 79 80 81	26
SEP 21	54 55 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 74 75 76 77 78 79 80 81	26
OCT 1	54 59 60 62 63 64 65 66 69 70 72 75 76 78 79 80 81	17

Exhibit 12.—Sample first-page output from program PRECIP2. This page shows image of input record and a data count. Input record reflects a request for PRECIP2 summary for NFWDL data from Riggins Ranger Station, Idaho, for the period 5/11/54 through 10/11/82. Data count indicates that 1982 data are not yet incorporated into NFWDL.

P R E C I P I T A T I O N BY 10 (OR 11)-DAY AND MONTHLY PERIODS

STATION NUMBER 101033 RIGGINS R.S. YRS 1954-1981

PERIOD BEGINS	NO. YRS	10-DAY AND MONTHLY TOTALS MEAN TOTAL	STD. DEV	MEDIAN	HIGHEST TOT.	YR	LOWEST TOT.	YR	I	MAXIMUM DAILY TOTALS EXTREME	YR	AVE MAX	STD DEV	MEDIAN
MAY 11	21	.431	.447	.260	1.67	69	.00	79	I	.85	69	.208	.210	.150
MAY 21	21	.670	.514	.610	2.12	70	.04	66	I	1.51	70	.401	.336	.390
JUN 1	27	.826	.664	.780	2.26	64	.00	73	I	1.23	54	.449	.337	.460
JUN 11	28	.600	.531	.325	1.79	65	.00	59	I	1.00	56	.302	.226	.280
JUN 21	27	.467	.528	.310	1.98	80	.00	81	I	1.10	58	.255	.295	.190
JUL 1	28	.369	.658	.135	3.01	78	.00	76	I	2.40	78	.277	.507	.125
JUL 11	28	.276	.353	.120	1.24	75	.00	79	I	.70	74	.191	.213	.115
JUL 21	28	.197	.218	.140	.82	77	.00	74	I	.38	64	.132	.124	.135
AUG 1	28	.217	.360	.015	1.24	60	.00	81	I	1.24	60	.147	.261	.015
AUG 11	28	.319	.478	.105	1.93	78	.00	77	I	.81	78	.177	.237	.075
AUG 21	28	.424	.478	.220	1.77	56	.00	74	I	1.00	56	.227	.266	.180
SEP 1	28	.229	.367	.100	1.71	70	.00	77	I	.94	70	.156	.214	.085
SEP 11	26	.583	.562	.455	1.95	80	.00	79	I	.96	55	.327	.279	.285
SEP 21	24	.385	.563	.150	2.17	59	.00	75	I	.95	59	.235	.286	.135
OCT 1	15	.519	.646	.170	2.10	62	.00	80	I	1.17	62	.297	.350	.170
MONTH									I					
JUN	27	1.859	1.034	1.680	4.13	64	.04	55	I	1.23	54	.604	.283	.560
JUL	28	.843	.750	.555	3.32	78	.02	69	I	2.40	78	.436	.471	.325
AUG	28	.960	.608	.695	2.39	65	.00	69	I	1.24	60	.376	.322	.310
SEP	24	1.192	.987	1.030	4.15	59	.04	74	I	.96	55	.475	.287	.460

@XQT SEM*CLIM.WINDS

Exhibit 13.—Sample program PRECIP2 summary of precipitation, means, medians, and extremes for Riggins Ranger Station, Idaho, during the period 1954-81.

Program WINDS

FUNCTION

Program WINDS computes and displays the percentage frequency of co-occurrence of windspeed with wind direction in selected class intervals both by 10-day period and by month.

OUTPUT

Program WINDS output consists of a one-page input image and data count for each station analyzed (exhibit 14), one page of co-occurrence tables for every six 10-day periods analyzed per station (exhibit 15), and one page of co-occurrence tables for every 6 months of data analyzed (exhibit 16) per station. The user can suppress the printing of the 10-day period tables if only the monthly tables each station to be analyzed. Input format specifications are similar to those for programs PRECIP1 and PRECIP2 (exhibit 11).

EXECUTION

The following control stream will generate the output exemplified in exhibits 14, 15, and 16 (see exhibit 11 for proper column assignment of input in item 6 below):

```
@RUN,P  RUNID,ACCOUNT,QUALIFIER,60,1000
@ASG,A  WEATHERFILE.
@USE  15.,,WEATHERFILE.
@ASG,A  CSSG*R1LIB.
@XQT  CSSG*R1LIB.WINDS
      241509UNION  PEAK  LO          6800.       070161083182
@EOF
@FIN
```

COST

Program WINDS will cost about 10 cents for an overnight run (priority P). This estimate is based on analysis of a 1,900- observation-day station.

```
 IMAGE OF INPUT RECORD    1

NUMBER          NAME            ELEVATION    BEGIN    END      IOUT

241509  UNION PEAK LO             6800.       70161    83182    0


                                        PROGRAM  WINDS

                                DATA COUNT BY YEARS AND 10-DAY PERIODS

PERIOD                                YEARS HAVING DATA FOR EACH PERIOD                                    TOTAL NUM
BEGINS                                                                                                      YEARS


JUL  1                          62 63 64 65 66 67 68 69 70       73             78 79 80 81                14
JUL 11                       61 62 63 64 65 66 67 68 69 70       73 74          78 79 80 81                16
JUL 21                       61 62 63 64 65 66 67 68 69 70       73 74          78 79 80 81                16
AUG  1                       61 62 63 64 65 66 67 68 69 70       73 74          78 79 80 81                16
AUG 11                       61 62 63 64 65 66 67 68 69 70       73 74          78 79 80 81                16
AUG 21                       61       64 65 66 67    69 70       73 74          78 79 80 81                13
```

Exhibit 14.—Sample first page output from program WINDS. This page shows image of input record and a data count. Input record reflects a request for WINDS summary for NFWDL data from Union Peak Lookout Station, Mont., for the period 7/1/61 through 8/31/82. Data count indicates that records for 1971, 1972, 1975, 1976, 1977, and 1982 are not available from the NFWDL.

W I N D S P E E D - D I R E C T I O N
PERCENTAGE FREQUENCY OF OCCURRENCE BY DIRECTION FOR SELECTED SPEED INCREMENTS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 241509 UNION PEAK LO 1961-1981

10-DAY PERIOD BEGINNING JUL 1

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	AVG SPEED
NE	1	13	3	40									4	53	4.5
E	1	13	1	13	1	13							3	40	5.7
SE	1	13	1	13	2	27	1	13					5	67	9.2
S			3	40	1	13							4	53	5.5
SW	3	40	5	67	4	53	3	40					15	200	7.7
W	2	27	6	80	9	120	1	13			1	13	19	253	8.8
NW	3	40	8	107	9	120	2	27					22	293	7.7
N	2	27					1	13					3	40	6.7
CLM															
TOT	13	173	27	360	26	347	8	107			1	13	75		7.7

10-DAY PERIOD BEGINNING JUL 11

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	A SP
NE	1	6	3	19	4	26	2	13	1	6			11	71	1
E	1	6			1	6							2	13	
SE	2	13	3	19	2	13	1	6					8	52	
S			3	19			1	6					4	26	
SW	4	26	11	71	8	52	3	19	2	13			28	181	
W	1	6	12	77	12	77	5	32	1	6	1	6	32	206	
NW	8	52	22	142	27	174	4	26	3	19	1	6	65	419	
N			2	13	3	19							5	32	
CLM															
TOT	17	110	56	361	57	368	16	103	7	45	2	13	155		

10-DAY PERIOD BEGINNING JUL 21

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	AVG SPEED
NE	4	23	5	29	4	23							13	74	5.9
E			1	6			1	6					2	11	10.0
SE	1	6	5	29	5	29							11	63	7.0
S															
SW	13	74	6	34	13	74	1	6					33	189	6.2
W	5	29	12	69	14	80	4	23					35	200	7.8
NW	5	29	29	166	28	160	9	51	1	6			72	411	8.3
N			1	6	2	11	2	11					5	29	12.0
CLM	4	23											4	23	.0
TOT	32	183	59	337	66	377	17	97	1	6			175		7.5

10-DAY PERIOD BEGINNING AUG 1

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	A SP
NE			12	75	6	38	2	13					20	126	
E					2	13							2	13	1
SE	1	6	5	31			1	6					7	44	
S	2	13	2	13									4	25	
SW	7	44	7	44	2	13	2	13	1	6			19	119	
W	5	31	15	94	12	75	4	25	2	13			38	239	
NW	3	19	23	145	21	132	12	75	3	19	2	13	64	403	1
N			1	6	1	6	1	6					3	19	1
CLM	2	13											2	13	
TOT	20	126	65	409	44	277	22	138	6	38	2	13	159		

10-DAY PERIOD BEGINNING AUG 11

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	AVG SPEED
NE			6	40	1	7							7	47	6.3
E			1	7	2	13	1	7	1	7			5	34	11.6
SE	1	7	3	20	6	40							10	67	7.7
S	1	7	1	7	1	7							3	20	6.7
SW	6	40	9	60	11	74			1	7			27	181	7.0
W	6	40	10	67	7	47	2	13	2	13			27	181	7.5
NW	3	20	17	114	26	174	12	81	3	20			61	409	10.0
N	2	13	2	13							1	7	5	34	11.2
CLM	4	27											4	27	.0
TOT	23	154	49	329	54	362	15	101	7	47	1	7	149		8.4

10-DAY PERIOD BEGINNING AUG 21

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	A SP
NE	1	8			5	41	2	16					8	66	1
E			3	25	1	8							4	33	
SE	2	16	3	25			1	8					6	49	
S			4	33	1	8	1	8			1	8	7	57	1
SW	10	82	6	49	2	16	2	16					20	164	
W	5	41	10	82	8	66	1	8					24	197	
NW	4	33	20	164	19	156	4	33	1	8			48	393	
N	1	8			1	8	1	8					3	25	
CLM	2	16											2	16	
TOT	25	205	46	377	37	303	12	98	1	8	1	8	122		

Exhibit 15.—Sample program WINDS table of co-occurrence of windspeed and direction by 10-day period for Union Peak Lookout Station, Mont., for the period 1961-81.

W I N D S P E E D - D I R E C T I O N
PERCENTAGE FREQUENCY OF OCCURRENCE BY DIRECTION FOR SELECTED SPEED INCREMENTS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 241509 UNION PEAK LO 1961-1981

MONTH JUL

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	AVG SPEED
NE	6	15	11	27	8	20	2	5	1	2			28	69	7.4
E	2	5	2	5	2	5	1	2					7	17	7.0
SE	4	10	9	22	9	22	2	5					24	59	7.1
S			6	15	1	2	1	2					8	20	6.5
SW	20	49	22	54	25	62	7	17	2	5			76	188	7.4
W	8	20	30	74	35	86	10	25	1	2	2	5	86	212	8.8
NW	16	40	59	146	64	158	15	37	4	10	1	2	159	393	8.4
N	2	5	3	7	5	12	3	7					13	32	9.3
CLM	4	10											4	10	.0
TOT	62	153	142	351	149	368	41	101	8	20	3	7	405		8.0

MONTH AUG

DIR.	0-3 N.	PCT	4-7 N.	PCT	8-12 N.	PCT	13-18 N.	PCT	19-24 N.	PCT	>24 N.	PCT	TOTAL N.	PCT	A SP
NE	1	2	18	42	12	28	4	9					35	81	
E			4	9	5	12	1	2	1	2			11	26	
SE	4	9	11	26	6	14	2	5					23	53	
S	3	7	7	16	2	5	1	2			1	2	14	33	1
SW	23	53	22	51	15	35	4	9	2	5			66	153	
W	16	37	35	81	27	63	7	16	4	9			89	207	
NW	10	23	60	140	66	153	28	65	7	16	2	5	173	402	
N	3	7	3	7	2	5	2	5			1	2	11	26	1
CLM	8	19											8	19	
TOT	68	158	160	372	135	314	49	114	14	33	4	9	430		

@XQT SEM*CLIM.THREEWAY

Exhibit 16.—Sample program WINDS table of co-occurrence of windspeed and direction by month for Union Peak Lookout Station, Mont., for the period 1961-81.

Program THREEWAY

FUNCTION

Program THREEWAY computes and displays the percentage frequency of co-occurrence of selected class values of dry bulb temperature, relative humidity, and windspeed.

OUTPUT

Program THREEWAY produces, for each station analyzed, one page consisting of the input image and data count (exhibit 17) and four pages of co-occurrence tables per month. The program also produces one page for each 10-day period (exhibit 18) and a one-page monthly summary (exhibit 19). The user can suppress the printing of the 10-day period tables if only the monthly tables are desired.

LIMITATIONS

Only 5 months can be analyzed at a time. For stations with more than 5 months data, the input stream must have two identical input records; except that the first record must include beginning and ending dates for the first 5 months, and the second record the dates for the next 5 months. A third record will be needed if a full year's data is to be analyzed.

INPUT

Prepare one input record per station per each 5 months included in the analysis. Input requirements are the same as for programs PRECIP1, PRECIP2, and WINDS (exhibit 11).

EXECUTION

The following FCCC runstream will cause THREEWAY to produce the output indicated in exhibit 17 and illustrated by exhibits 18 and 19 (see exhibit 11 for proper column assignment of input in item 6 below):

```
@RUN,P RUNID,ACCOUNT,QUALIFIER,60,1000
@ASG,A WEATHERFILE.
@USE 15.,WEATHERFILE.
@ASG,A CSSG*R1LIB.
@XQT CSSG*R1LIB.THREEWAY
      241902HELENA SERVICE SITE 3852.      051162093082
@EOF
@FIN
```

COST

It costs about 30 cents to run program THREEWAY on an overnight priority (priority P) for a 1,900-observation-day station. This estimate is for analysis of 5 months of data.

IMAGE OF INPUT RECORD 1

NUMBER	NAME	ELEVATION	BEGIN	END	IOUT
241902	HELENA SERVICE SITE	3952.	51162	93082	0

PROGRAM THREEWAY

DATA COUNT BY YEARS AND 10-DAY PERIODS

PERIOD BEGINS	YEARS HAVING DATA FOR EACH PERIOD	TOTAL NUM YEARS
MAY 11	63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	19
MAY 21	63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	19
JUN 1	63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	19
JUN 11	63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	19
JUN 21	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
JUL 1	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
JUL 11	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
JUL 21	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
AUG 1	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
AUG 11	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
AUG 21	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
SEP 1	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
SEP 11	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20
SEP 21	62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81	20

Exhibit 17.—Sample first page output from program THREEWAY. This page shows image of input record and a data count. Input record reflects a request for THREEWAY summary for NFWDL data from Helena Service Site Station, Mont., for the period 5/11/62 through 9/30/82. Data count indicates a near complete data set except for initial 10-day periods in 1962 and unavailability of 1982 data.

TEMPERATURE - RELATIVE HUMIDITY - WINDSPEED
PERCENTAGE FREQUENCY OF OCCURRENCE FOR SELECTED COMBINATIONS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 241902 HELENA SERVICE SITE 1962-1981

10-DAY PERIOD BEGINNING JUN 1

WIND SPEED 0-4 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89										
80-84		5								
75-79		5	5							
70-74			5	11						
65-69				5	11					
60-64			5		11	5				
55-59							11			
50-54							5	5		
45-49						5				
40-44										
35-39										
30-34										
<30										
TOTAL		11	16	16	21	11		16	5	
NUMBER	0	2	3	3	4	2	0	3	1	0

WIND SPEED 5-9 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89		5	5							
80-84		11	21	16						
75-79			26	11						
70-74			32	21	16	11				
65-69			11	37	11	16				
60-64				16	37	21				
55-59					21		11	5	11	
50-54							5		11	
45-49										
40-44										
35-39										
30-34										
<30										
TOTAL		16	95	101	85	48	16	5	21	
NUMBER	0	3	18	19	16	9	3	1	4	0

WIND SPEED 10-14 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89		11	5							
80-84		16								
75-79		5	26	5						
70-74			11	11		5				
65-69		11	21	11	5	5				
60-64			5	26	11	11	5	5		
55-59						5	5	5		
50-54			5				11		11	
45-49							5	5		
40-44										
35-39										
30-34										
<30										
TOTAL		42	74	53	16	26	26	16	11	
NUMBER	0	8	14	10	3	5	5	3	2	

WIND SPEED 15-19 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94		5								
85-89			5							
80-84		21								
75-79			16		5					
70-74			16	16						
65-69			5	16	11					
60-64			5	11		11				
55-59			5		11		5			
50-54						5				
45-49										
40-44										
35-39										
30-34										
<30										
TOTAL		26	53	42	26	16	5			
NUMBER	0	5	10	8	5	3	1	0	0	0

WIND SPEED GREATER/EQUAL 20 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89			5							
80-84				11						
75-79			5		5					
70-74				11						
65-69			5		5					
60-64			16	5						
55-59				5	5					
50-54				5		5	5			
45-49								5		
40-44										
35-39										
30-34										
<30										
TOTAL			32	26	11	5	5		5	
NUMBER	0	0	6	5	2	1	1	0	1	0

TOTAL	NUMBER
	0
	0
5	1
37	7
90	17
111	21
164	31
185	35
206	39
106	20
74	14
21	4
	0
	0
	0
	0
1000	
	189

Exhibit 18.—Sample program THREEWAY table of co-occurrence of temperature, relative humidity, and windspeed for 10-day period June 1-10 for Helena Service Site Station, Mont., for the period 1962-81. A similar table is produced for each 10-day period included in the analysis.

T E M P E R A T U R E - R E L A T I V E H U M I D I T Y - W I N D S P E E D
PERCENTAGE FREQUENCY OF OCCURRENCE FOR SELECTED COMBINATIONS
-GIVEN TO TENTHS PERCENT, DECIMAL POINT OMITTED

STATION NUMBER 241902 HELENA SERVICE SITE 1962-1981

MONTH JUN

WIND SPEED 0-4 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89			2	2						
80-84		2	3							
75-79		2	3	7						
70-74			3	3	3	2				
65-69				5	7	3	2			
60-64			2		3	3	5			
55-59					2	3		3	2	
50-54								3	2	
45-49						2				
40-44										
35-39										
30-34										
<30										
TOTAL		3	14	17	16	14	7	7	3	
NUMBER	0	2	8	10	9	8	4	4	2	0

WIND SPEED 5-9 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94			3	2						
85-89			7	10						
80-84			12	22	17	2				
75-79			2	24	22	9	2			
70-74			2	24	21	19	7			
65-69				9	22	19	16	2	2	
60-64					7	17	10		2	
55-59				2	2	10		5	3	3
50-54							2	2	2	9
45-49									2	
40-44										2
35-39										
30-34										
<30										
TOTAL			26	93	92	76	36	9	10	14
NUMBER	0	0	15	54	53	44	21	5	6	8

WIND SPEED 10-14 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94				5						
85-89				9	10					
80-84				16	3	3				
75-79				7	29	14				
70-74				2	10	10	5	3		
65-69				3	10	14	7	9		
60-64					9	14	7	9	3	5
55-59							3	5	9	3
50-54					2				12	2
45-49							2		3	5
40-44										
35-39										
30-34										
<30										
TOTAL			42	74	55	24	26	28	16	9
NUMBER	0	0	24	43	32	14	15	16	9	5

WIND SPEED 15-19 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94		7								
85-89		5	2							
80-84		14	14							
75-79		7	21	3	3					
70-74		3	9	10						
65-69		3	14	12	7	2				
60-64			5	5	5	5	2			
55-59			2	3	5	2	3	2		
50-54				2		5	3	2	2	
45-49									2	
40-44					2					
35-39										
30-34										
<30										
TOTAL		40	66	36	22	14	9	3	3	
NUMBER	0	23	38	21	13	8	5	2	2	0

WIND SPEED GREATER/EQUAL 20 MPH

TEMP. DEG F	RELATIVE HUMIDITY 1 TO 10	11 TO 20	21 TO 30	31 TO 40	41 TO 50	51 TO 60	61 TO 70	71 TO 80	81 TO 90	91 TO 100
<100										
95-99										
90-94										
85-89				3						
80-84		10								
75-79		9	3		2					
70-74		3	3	5						
65-69			3	2	2	2				
60-64			9	3	3	2				
55-59				5	5					
50-54			3	2	2	2	2			
45-49									2	
40-44										
35-39										
30-34										
<30										
TOTAL			22	26	17	14	5	2		2
NUMBER	0	0	13	15	10	8	3	1	0	1

TOTAL	NUMBER
	0
	0
17	10
50	29
119	69
170	98
151	87
176	102
137	79
88	51
66	38
21	12
3	2
	0
2	1
	0
1000	
	578

Exhibit 19.—Sample program THREEWAY monthly summary table of co-occurrence of temperature, relative humidity, and windspeed for month of June at Helena Service Site during the period 1962-81. A similar table is produced for each month included in the analysis.

User Worksheet

The information that a user must supply to run the climatology programs is indicated on the climatology programs user worksheet (exhibit 20). The worksheet not only prompts the user for the required information but also serves as a request for ADP service when someone other than the user actually operates the computer terminal. A copy of the user worksheet suitable for reproduction is included in appendix B.

Climatology Program Request
Sheet Number 1

USER WORKSHEET: Programs SUMMARY, PRECIP1
PRECIP2, WINDS, and THREEWAY

Charge Number: SEM Date: 2-3-84

User: BRADSHAW & FISCHER

Project: CLIMATOLOGY PROGRAM GUIDE

Station Name[1]: HUNGRY HORSE R.S. Number 240217

Station Elevation: 3225 ft. NFWDL File Name[2]: 21-24

Year Begin 1954 Year End 1982

Program request and description of desired data base[3]:

	SUMMARY	PRECIP1	PRECIP2	WINDS	THREEWAY[4]
Date begin: (MMDDYY)[5]	051158				
Date end: (MMDDYY)[5]	103182				
Minimum days/ 10-day period	✓ (6 is default)		(8 is default)		
Output level[6] (0 is default)					

If SUMMARY:

	Parameter(s) to be summarized[7]	Table(s) to be printed out[8]
✓	Dry bulb temperature	(1) (2) (3) (4) (5)
	Maximum daily temperature	1 2 3 4 5
	Minimum daily temperature	1 2 3 4 5
	Mean daily temperature	1 2 3 4 5
	Relative humidity	1 2 3 4 5
	Maximum relative humidity	1 2 3 4 5
	Minimum relative humidity	1 2 3 4 5
	Mean relative humidity	1 2 3 4 5

[1] 20 character limit.
[2] Refer to "The National Fire Weather Data Library: What it is and how to use it" by R. William Furman and Glen E. Brink, USDA Forest Service Gen. Tech. Rep. RM-19, Rocky Mountain Forest and Range Experiment Station. Ft. Collins, CO 80521. 1975. 8 p.
[3] Indicate programs to be run by entering desired begin and end dates of desired data base under appropriate program name.
[4] Maximum of 5 months per execution.
[5] Enter dates in form of MM (month) DD (day) and YY (year), for example: 050962 (May 9, 1962).
[6] 0 = 10 day and monthly totals; 1 = monthly tables only.
[7] Check (✓) parameters to be summarized.
[8] Circle desired output.

Exhibit 20.—Sample user worksheet and program request for climatology programs; SUMMARY, PRECIP1, PRECIP2, WINDS, and THREEWAY. The program request in this sample will produce the climatological summaries displayed as exhibits 1 through 6.

THE AVERAGING PROGRAMS

General Instructions

Programs AVERAGE1, AVERAGE2, and AVERAGE3 are designed to enhance the reliability and, therefore, the utility of short-term and incomplete weather station records in the NFWDL.

Data may prove deficient for two reasons. First, stations may provide relatively few years of data (perhaps only 8 to 10 years). This situation results when a station is closed after only a few years of operation or when a new station is started. A data deficiency may also result when a station is operated in conjunction with the fire season. Such stations may be operative earlier or later (or both) during severe fire seasons than during "normal" fire seasons. Such situations usually result in a "hot and dry" bias in spring and fall data.

IDENTIFYING DATA DEFICIENCIES

Deficiencies in NFWDL station data can be identified in several ways. Furman and Brink (1975) tell how to obtain an inventory of a NFWDL station's data. This inventory lists all the years for which data are available and the number of observation days contained in each year's station record. The inventory can be used both to identify stations with deficient data and to identify nearby stations with longer, more complete records. The first page of output from the climatology programs also shows the character of a station's data base for the period requested (exhibits 1, 8, 12, 14, and 17). This source identifies by year the 10-day periods for which data are available.

PROGRAM INPUT

Input for the averaging programs consists of previously computed 10-day and monthly climatic means from both the data-deficient station and one or two nearby stations with more complete data. Output tables from programs SUMMARY and PRECIP2 are useful sources for such values. Other sources of climatic data are identified by Haines (1977).

PROGRAM OUTPUT

Output from the averaging programs is in tabular form, fashioned after those presented by Finklin (1983). Users desiring more information on the averaging methods embodied in the programs and interpretation of output should consult Finklin (1983).

Program AVERAGE1

FUNCTION

Program AVERAGE1 computes adjusted 10-day and monthly mean values of temperature and relative humidity data by means of a modified difference method (Finklin 1983) for a station with incomplete early and late season data (often a mountaintop or lookout station). The program uses period mean values for the incomplete station together with complete season mean values (usually from a nearby valley bottom Ranger Station) for the same period of record.

OUTPUT

AVERAGE1 produces 1 page of output for each averaged parameter (exhibit 21). Multiple parameters can be averaged in one run by reprinting the execution sequence in lines 4 through 10 below. This repetition should follow line 10 of the original run, with the information modified as needed.

INPUT

AVERAGE1 uses only a user input stream. The first record sets up run parameters, and subsequent records hold sequential 10-day mean values for both the incomplete and the complete stations. These are then followed by sequential monthly mean values. Input formats are detailed in exhibit 22. A completed user worksheet containing required input information for the sample run described below is presented as exhibit 23. Mean values are taken from a previous run of program SUMMARY.

EXECUTION

The following runstream will generate the output exemplified by exhibit 21 (see exhibit 22 for proper column assignment of input in items 4 through 12 below):

```
@RUN,P RUNID,ACCOUNT,QUALIFIER,60,100
@ASG,A CSSG*R1LIB.
@XQT CSSG*R1LIB.AVERAGE1
DRY BULB TEMPERATURENINEMILE RS          54017003WILLIAMS PEAK LO 6068
70.1 78.4 (July, period 1)
73.2 82.8 (July, period 2)
73.9 84.4 (July, period 3)
72.3 82.9 (August, period 1)
72.5 82.3 (August, period 2)
68.0 76.5 (August, period 3)
73.0 81.9 (July, monthly mean)
71.2 80.4 (August, monthly mean)
@EOF
@FIN
```

The following program SUMMARY execution on an appropriate NFWDL data file computed the mean values used in the above input stream.

```
@XQT CSSG*R1LIB.SUMMARY
DRY BULB TEMPERATURE      241305WILLIAMS PEAK LO     5450. 1000000701540831 70
DRY BULB TEMPERATURE      241507NINEMILE RANGER ST   3154. 1000000701540831 70
@EOF
```

COST

AVERAGE1 will always cost the batch minimum of 50 cents.

ADJUSTMENT OF FIRE-WEATHER AVERAGES AT LOOKOUTS

BASED ON DIFFERENCE (TEMP & HUMIDITY) OR RATIO (PRECIP)
METHODS DESCRIBED BY:

ARNOLD I. FINKLIN, 1983. SUMMARIZING WEATHER & CLIMATIC DATA
GEN TECH REP INT-148, USDA, FS INTERMT FOR & RNG EXP STN
PP. 23-26; TABLE 2.

DRY BULB TEMPERATURE

COMPLETE RECORD STATION: NINEMILE RS YEARS: 1954 THROUGH 1970

INCOMPLETE RECORD STATION: WILLIAMS PEAK LO YEARS: 1954 THROUGH 1970

10 DAY PERIOD BEGINNING	INCOMPLETE AVERAGE	COMPLETE AVERAGE	DIFFERENCE	SMOOTHED DIFFERENCE	ADJUSTED AVERAGE
JUL 01	70.1	78.4	-8.3	-10.1	68.3
JUL 11	73.2	82.8	-9.6	-10.1	72.8
JUL 21	73.9	84.4	-10.5	-10.3	74.1
AUG 01	72.3	82.9	-10.6	-10.4	72.5
AUG 11	72.5	82.3	-9.8	-10.2	72.1
AUG 21	68.0	76.5	-8.5	-10.2	66.3
MONTH JUL	73.0	81.9			71.8
MONTH AUG	71.2	80.4			70.2

Exhibit 21.—Sample of Program AVERAGE1 output showing adjusted average dry bulb temperature for an incomplete record station; Williams Peak Lookout, Mont. Adjusted temperatures are based on more complete records from the nearby Ninemile Ranger Station.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function	PROGRAM NAME SEM*CLIM.AVERAGE1	
	D	Duplicate	PROGRAM NUMBER	DATE 12/81
	P	Punch	SOURCE DOCUMENT RECORD FORM USE	
	S	Skip		
	V	Verify		
	L	Left justify	PREPARED BY Larry Bradshaw	PAGE 1 of 1

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
1. PARAMETER	1	20	20	P	Parameter name
2. NAME OF COMPLETE RECORD STATION	21	40	20	P	
3. YEAR COMPLETE RECORD BEGIN	41	42	2	P	right justify
4. YEAR COMPLETE RECORD END	43	44	2	P	right justify
5. MONTH COMPLETE RECORD BEGIN	45	46	2	P	right justify
6. PERIOD COMPLEGE RECORD BEG.	47	48	2	P	(01 for days 1-10; 02 for 11-20; 03 for 21-31) right justify
7. MONTH COMPLETE RECORD END	49	50	2	P	right justify
8. PERIOD COMPLETE RECORD END	51	52	2	P	same as number 6
9. INCOMPLETE RECORD STATION NAME	53	72	20	P	
10. YEAR INCOMPLETE STATION BEGINS	73	74	2	P	right justify
11. YEAR INCOMPLETE STATION DATA END	75	76	2	P	right justify
***Now, for each 10-day period enter one record with the incomplete mean value followed by the long-term mean value. After all 10-day periods are entered, enter monthly mean values.					
10-day period mean values punched	1	10	10	P	FORMAT (2F5.a1), decimal
				ex.	1234567890 83.1 91.2

**********END OF INPUT STREAM FOR AVERAGE1**********

Exhibit 22.—Input format specifications for Program AVERAGE1.

Climatology Program Request and
User Worksheet Number 2

PROGRAM AVERAGE1

Temperature or Humidity Variable to be Summarized: DRY BULB TEMP.

Complete Record Station Name: NINE MILE R.S.

Incomplete Record Station Name: WILLIAMS PEAK L.O.

DATA BASE DESCRIPTION:

	Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
Complete station	54	70	07	01	08	03
Incomplete station	54	70	07	01	08	03

10-DAY AND MONTHLY MEAN VALUES[2]:

Period	Incomplete station	Complete station	Period (con.)	Incomplete (con.)	Complete (con.)
Jul. 1	70.1	78.9			
Jul. 11	73.2	82.8			
Jul. 21	73.9	84.4			
AUG. 1	72.3	82.9			
AUG. 11	72.5	82.3			
AUG. 21	68.0	76.5			
JULY	73.0	81.9			
AUGUST	71.2	80.4			

[1] 10-day period within each month. Enter 01 for days 1-10, 02 for days 11-20, and 03 for days 21-31.

[2] Enter 0 if data is missing. Enter all 10-day periods and their monthly mean values, in sequence.

Exhibit 23.—Completed user worksheet and program request for the program AVERAGE1 example used to generate output in exhibit 21.

Program AVERAGE2

FUNCTION

Program AVERAGE2 computes adjusted and extrapolated (lengthened season) 10-day and monthly average precipitation for a complete fire weather season at weather stations having a relatively short season and period of record. Adjustments and extrapolations are obtained by a modified ratio method (Finklin 1983) using previously computed mean values from a station with short season and period of record, and two nearby stations with long periods of record and full season's data.

OUTPUT

AVERAGE2 produces one page of output per station (exhibit 24).

EXECUTION

The following runstream will generate the output exemplified by exhibit 24:

```
@RUN,L RUNID,ACCOUNT,QUALIFIER, TIME, PAGES
@ASG,A CSSG*R1LIB.
@XQT CSSG*R1LIB.AVERAGE2
AVG PRECIP (INCHES)
NINEMILE R.S.          POWELL R.S.            54700510
0.000  0.000
0.503  0.837
0.529  0.890
0.829  1.009
0.668  0.840
0.645  1.075
0.418  0.558
0.312  0.339
0.172  0.218
0.316  0.278
0.278  0.390
0.571  0.712
0.280  0.720
0.616  1.162
0.364  0.728
0.559  1.237
0.627  1.071
0.000  0.000
LOLO R.S.              NINEMILE R.S.          POWELL R.S.            54670708
0.526  0.503  0.610
0.344  0.289  0.331
0.176  0.146  0.206
0.246  0.374  0.284
0.269  0.144  0.322
0.736  0.620  0.753
@EOF
@FIN
```

The following execution of PRECIP2 on an appropriate NFWDL data file produced the mean values used in the above input stream.

```
@XQT CSSG*R1LIB.PRECIP2
      101031POWELL RANGER STN    3409      050154103170
      101031POWELL RANGER STN    3409      070154083167
      241506LOLO RANGER STN      3400      070154083167
      241507NINEMILE RANGER STN  3154      050154103170
      241507NINEMILE RANGER STN  3154      070154083167
@EOF
```

COST

AVERAGE2 will cost the batch minimum of 50 cents.

INPUT

Program AVERAGE2 requires:

1. Previously computed short season, short period of record average 10-day precipitation amounts at the short season station, and two nearby stations (available from PRECIP2, see exhibit 13), and

2. Previously computed long period of record, full season, 10-day average precipitation amounts at the two nearby stations (available from PRECIP2, see exhibit 13).

Input formats for AVERAGE2 are detailed in exhibit 25. A complete user worksheet containing required input information for the sample run described below is presented as exhibit 26.

1 EXTRAPOLATED AND SMOOTHED 10-DAY AVERAGE PRECIPITATION AMOUNTS

BASED ON METHODS DESCRIBED BY FINKLIN (1983).

SUMMARIZING WEATHER & CLIMATIC DATA, INT-148, USDA, FS
INTERMT FOR & RNG EXP STN, PP. 26-27; TABLE 3.

	AVERAGE PRECIP. 1954 - 1967					AVERAGE PRECIP. 1954 - 1970					LOLO R.S.	
DATA PERIOD	LOLO R.S (1)	NINE MILE (2)	POWELL R (3)	AVE 2&3 (4)		NINE MILE (5)	POWELL R (6)	AVE 5&6 (7)	SMOOTHED UNADJ (8)	SMOOTHED ADJ (9)	RATIO 1:4 (10)	ADJ AVE (11)
MAY 01						0.000	0.000	0.000	0.629	0.629		0.629
MAY 11						0.503	0.837	0.670	0.683	0.683		0.683
MAY 21						0.529	0.890	0.709	0.738	0.738		0.738
JUN 01						0.829	1.009	0.919	0.857	0.857		0.857
JUN 11						0.668	0.840	0.754	0.799	0.799		0.799
JUN 21						0.645	1.075	0.860	0.780	0.780		0.780
JUL 01	0.526	0.503	0.610	0.556		0.418	0.558	0.488	0.523	0.523		0.523
JUL 11	0.344	0.289	0.331	0.310		0.312	0.339	0.326	0.331	0.331		0.331
JUL 21	0.176	0.146	0.206	0.176		0.172	0.218	0.195	0.234	0.234		0.234
AUG 01	0.246	0.374	0.284	0.329		0.316	0.278	0.297	0.286	0.286		0.286
AUG 11	0.269	0.144	0.322	0.233		0.278	0.390	0.334	0.379	0.379		0.379
AUG 21	0.736	0.620	0.753	0.687		0.571	0.712	0.641	0.567	0.567		0.567
SEP 01						0.280	0.720	0.500	0.588	0.588		0.588
SEP 11						0.616	1.162	0.889	0.767	0.767		0.767
SEP 21						0.364	0.728	0.546	0.662	0.662		0.662
OCT 01						0.559	1.237	0.898	0.831	0.831		0.831
OCT 11						0.627	1.071	0.849	0.865	0.865		0.865
OCT 21						0.000	0.000	0.000	0.899	0.899		0.899
MONTH:												
JUL	1.046	0.938	1.147	1.043								
AUG	1.251	1.138	1.359	1.248								
TOTAL	2.297			2.291							1.003	

Exhibit 24.—Sample of Program AVERAGE2 output.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function	PROGRAM NAME SEM*CLIM.AVERAGE2	
	D	Duplicate	PROGRAM NUMBER	DATE 12/81
	P	Punch		
	S	Skip	SOURCE DOCUMENT RECORD FORM USE	
	V	Verify		
	L	Left justify	PREPARED BY Larry Bradshaw	PAGE 1 of 2

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
CARD NUMBER 1. HEADING	1	80	80	P	any heading, include parameter
INPUT SEQUENCE NUMBER 2----------					
2.1 First long-term station	1	20	20	P	enter station name
2.2 Second long-term station	21	40	20	P	enter station name
2.3 Year begin	41	42	2	P	year data begin at long-term
2.4 Year data end (long)	43	44	2	P	year long-term data end
2.5 Month data begin	45	46	2	P	month long-term data begin
2.6 Month data end	47	48	2	P	month long-term data end
**** Now for each 10-day period enter the mean precip. amounts for station 2.1 and					
2.2 respectively (one card per 10-day period) - 3 periods/month; if missing enter 0.					
Mean precip. amounts	1	12	12	P	Format (2F6.3)
INPUT SEQUENCE NUMBER 3----------					
3.1 Short-term station	1	20	20	P	enter short-term station name
3.2 First long-term station	21	40	20	P	same as item 2.1
3.3 Second long-term station	41	60	20	P	same as item 2.2
3.4 Short year begin	61	62	2	P	year short data begin
3.5 Short year end	63	64	2	P	year short data end
3.6 Month short data begin	65	66	2	P	month short data begin
3.7 Month short data end	67	68	2	P	month short data end
*** Now enter for each 10-day period of the short station (short years too) the					

(con.)

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function	PROGRAM NAME SEM*CLIM.AVERAGE2	
	D	Duplicate	PROGRAM NUMBER	DATE 12/81
	P	Punch	SOURCE DOCUMENT RECORD FORM USE	
	S	Skip		
	V	Verify		
	L	Left justify	PREPARED BY Larry Bradshaw	PAGE 2 of 2

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
Mean precip. by period	1	18	18	P	**FORMAT (3F6.3) with decimal

10-day mean precip. amounts for the three stations in items 3.1, 3.2 and 3.3, respectively. Three per record, one record per period format (3F6.3) always with three periods per month. If one is missing, enter 0. Means are from the same set of years for all three stations (defined by short station) and are not the same as in input sequence number 2 above. This means two runs of climatology program PRECIP2 for the long-term station. One for the long-term averages and one for the short-term averages.

Exhibit 25.—Input format specifications for Program AVERAGE2.

Climatology Program Request and
User Worksheet Number 3

Program AVERAGE2

1.0 Heading: AVERAGE PRECIP. (INCHES)

LONG TERM STATION SPECIFICATIONS

2.1 First long-term station name: NINEMILE R.S.
2.2 Second long-term station name: POWELL R.S.
2.3 Year begin: 1954 2.4 Year end: 1967
2.5 Month begin: MAY (05) 2.6 Month end: OCT (10)

SHORT TERM STATION SPECIFICATIONS

3.1 Short-term station name: LOLO R.S.
3.4 Year begin: 1954 3.5 Year end: 1967
3.6 Month begin: JULY (07) 3.7 Month end: AUGUST (08)

10-DAY PERIOD MEAN AMOUNTS

	Long-term means[1] (sequence 2)		Short-term means[1] (sequence 3)			
Period[2]	Long 1	Long 2	Period[2]	Short 1	Long 1	Long 2
MAY 1	0.000		JUL 1	0.526	0.503	0.610
MAY 11	0.503		JUL 11	0.344	0.289	0.331
MAY 21	0.529		JUL 21	0.176	0.146	0.206
JUN 1	0.829		AUG 1	0.246	0.374	0.284
JUN 11	0.668		AUG 11	0.267	0.144	0.322
JUN 21	0.645		AUG 21	0.736	0.620	0.253
JUL 1	0.418					
JUL 11	0.312					
JUL 21	0.172					
AUG 1	0.316					
AUG 11	0.278					
AUG 21	0.571					
SEP 1	0.280					
SEP 11	0.616					
SEP 21	0.364					
OCT 1	0.559					
OCT 11	0.627					
OCT 21	0.000					

[1] Enter 0 if missing.
[2] Enter period beginning date; May 1, May 11, etc.

Exhibit 26.—Completed user worksheet and program request for the Program AVERAGE2 example used to generate output in exhibit 24.

Program AVERAGE3

FUNCTION

Program AVERAGE3 computes adjusted and extrapolated (lengthened season) 10-day and monthly mean values of temperature and relative humidity (available from Program SUMMARY) for a weather station that has a relatively short season of observation. Adjustments and extrapolations are based on differences from peak-season values (Finklin 1983).

OUTPUT

AVERAGE3 produces one page of output per parameter (exhibit 27).

INPUT

Program AVERAGE3 requires:

1. Previously computed short season, short period of record average 10-day parameter values at the short season station, and at two nearby stations (available from program SUMMARY), and
2. Previously computed long period of record, full season 10-day average parameter values at the two nearby stations (also available from program SUMMARY).

Input formats for program AVERAGE3 are detailed in exhibit 28. A completed user worksheet containing input information for the sample run described below is presented as exhibit 29.

EXECUTION

The following runstream will generate the output exemplified by exhibit 27:

```
@RUN,P RUNID, ACCOUNT, QUALIFIER,60,100
@ASG, A CSSG*R1LIB.
@XQT CSSG*R1LIB.AVERAGE3
DRY BULB TEMPERATURE
NINEMILE R.S.          POWELL R.S.            5470050210O2
63.0  60.9
65.4  63.3
68.2  66.8
70.0  69.8
72.3  70.6
78.4  77.4
82.7  81.7
84.4  82.5
82.9  81.4
82.3  80.0
76.5  74.2
74.2  72.3
67.5  64.0
65.3  61.4
59.1  55.1
54.4  50.0
NINEMILE R.S.          POWELL R.S.            LOLO R.S.              546707010901
77.7  76.3  74.6
83.5  82.2  80.7
84.9  82.7  81.9
82.8  81.4  80.0
83.3  80.9  79.8
75.4  72.8  72.1
74.4  72.2  71.4
@EOF
@FIN
```

The following execution of program SUMMARY on an appropriate NFWDL data file produced the mean values used in the above input stream.

```
@XQT CSSG*R1LIB.SUMMARY
DRY BULB TEMPERATURE      101031POWELL RANGER STN.  3409. 10000050154103170
DRY BULB TEMPERATURE      101031POWELL RANGER STN.  3409. 10000070154083167
DRY BULB TEMPERATURE      241506LOLO RANGER STATION 3400. 10000070154083167
DRY BULB TEMPERATURE      241507NINEMILE RANGER STN 3154. 10000050154103170
DRY BULB TEMPERATURE      241507NINEMILE RANGER STN 3154. 10000070154083167
@EOF
```

COST

AVERAGE3 will cost the batch minimum of 50 cents.

EXTRAPOLATION OF FIRE-WEATHER STATISTICS AT VALLEY OR CANYON LOCATIONS

BASED ON A DIFFERENCE METHOD DESCRIBED BY:

ARNOLD I. FINKLIN, 1983 - SUMMARIZING WEATHER & CLIMATIC DATA
GEN TECH REP INT-148, USDA, FS INTERMT FOR & RAN EXP STN
P. 26-29; TABLES 4 & 5.

DRY BULB TEMPERATURE

1954 - 1970

BEGINNING	NINEMILE R (1)	POWELL R.S (2)	(5) + (8) (9)	(10)	(11)	(12)	(13)	(14)	EST. AVE. AT LOLO R.S. (15)
MAY 11	63.0	60.9	0.0	-21.4	-21.6	0.0	-21.5	-21.5	60.1
MAY 21	65.4	63.3	0.0	-19.0	-19.2	0.0	-19.1	-19.0	62.6
JUN 01	68.2	66.8	0.0	-16.2	-15.7	0.0	-15.9	-16.1	65.5
JUN 11	70.0	69.8	0.0	-14.4	-12.7	0.0	-13.5	-13.7	67.9
JUN 21	72.3	70.6	0.0	-12.1	-11.9	0.0	-12.0	-11.3	70.3
JUL 01	78.4	77.4	75.5	-6.0	-5.1	-6.1	-6.1	-6.3	75.3
JUL 11	82.7	81.7	80.1	-1.7	-0.8	-1.5	-1.5	-2.0	79.5
JUL 21	84.4	82.5	81.6	0.0	0.0	0.0	0.0	-0.5	81.1
AUG 01	82.9	81.4	80.1	-1.5	-1.1	-1.5	-1.5	-1.4	80.1
AUG 11	82.3	80.0	78.9	-2.1	-2.5	-2.7	-2.7	-3.4	78.1
AUG 21	76.5	74.2	73.4	-7.9	-8.3	-8.2	-8.2	-7.6	73.9
SEP 01	74.2	72.3	71.3	-10.2	-10.2	-10.2	-10.2	-11.1	70.4
SEP 11	67.5	64.0	0.0	-16.9	-18.5	0.0	-17.7	-16.9	64.7
SEP 21	65.3	61.4	0.0	-19.1	-21.1	0.0	-20.1	-20.7	60.8
OCT 01	59.1	55.1	0.0	-25.3	-27.4	0.0	-26.3	-26.1	55.4
OCT 11	54.4	50.0	0.0	-30.0	-32.5	0.0	-31.3	-31.3	50.3

DRY BULB TEMPERATURE

1954 - 1967

BEGINNING	NINEMILE R (3)	POWELL R.S (4)	LOLO R.S. (5)	(6)	(7)	(8)
JUL 01	77.7	76.3	74.6	0.7	1.1	0.9
JUL 11	83.5	82.2	80.7	-0.8	-0.5	-0.7
JUL 21	84.9	82.7	81.9	-0.5	-0.2	-0.3
AUG 01	82.8	81.4	80.0	0.1	0.0	0.0
AUG 11	83.3	80.9	79.8	-1.0	-0.9	-0.9
AUG 21	75.4	72.8	72.1	1.1	1.4	1.3
SEP 01	74.4	72.2	71.4	-0.2	0.1	0.0

Exhibit 27.—Sample of output from Program AVERAGE3 for dry bulb temperature.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function	PROGRAM NAME SEM*CLIM.AVERAGE3	
	D	Duplicate	PROGRAM NUMBER	DATE 12/81
	P	Punch		
	S	Skip	SOURCE DOCUMENT RECORD FORM USE	
	V	Verify		
	L	Left justify	PREPARED BY Larry Bradshaw	PAGE 1 of 2

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
INPUT SEQUENCE NUMBER 1----------					
1.1 Heading	1	80	80	P	enter parameter and other info.
INPUT SEQUENCE NUMBER2----------					
2.1 First long-term station	1	20	20	P	enter station name
2.2 Second long-term station	21	40	20	P	enter second station name
2.3 Year data begin	41	42	2	P	enter year (YY)
2.4 Year data end	43	44	2	P	enter year (YY)
2.5 Month data begin	45	46	2	P	enter month (MM), right justify
2.6 Period data begin	47	48	2	P	01, 02, or 03 right justified
2.7 Month data end	49	50	2	P	enter month (MM) right justify
2.8 10-day period data ends	51	52	2	P	01, 02, or 03 right justified
*** Now enter mean parameter values for the two stations (items 2.1 and 2.2) one card per 10-day period, two entries per card.					
10-day mean values	1	10	10	P	Format (2F5.1)
INPUT SEQUENCE NUMBER 3----------					
3.1 First short station	1	20	20	P	enter name, same as 2.1
3.2 Second short station	21	40	20	P	enter name, same as 2.2
3.3 Third short station	41	60	20	P	enter name
3.4 Short year begin	61	62	2	P	enter year (YY)
3.5 Short year data end	63	64	2	P	enter year (YY)

(con.)

Exhibit 28.—Input format specifications for Program AVERAGE3.

INPUT RECORD AND COLUMN ASSIGNMENT	Symbol	*Function	PROGRAM NAME SEM*CLIM.AVERAGE3	
	D	Duplicate	PROGRAM NUMBER	DATE 12/81
	P	Punch		
	S	Skip	SOURCE DOCUMENT RECORD FORM USE	
	V	Verify		
	L	Left justify	PREPARED BY Larry Bradshaw	PAGE 2 of 2

RECORD FIELD	COLUMNS FROM	COLUMNS TO	NO. COLS.	FUNC. *	REMARKS
3.6 Short month data begin	65	66	2	P	enter month (MM) - right justify
3.7 Short period begin	67	68	2	P	01, 02, or 03 - right justify
3.8 Short month data end	69	70	2	P	enter month (MM) - right justify
3.9 Short period end	71	72	2	P	01, 02, or 03 - right justify
*Now enter, for each 10-day period, the mean values of the three stations per card.					
10-day mean short period values	1	15	15	P	Format (3F5.1) with decimal

**********END OF INPUT STREAM FOR AVERAGE3**********

Exhibit 28.—(con.)

Climatology Program Request and
User Worksheet Number 4

Program AVERAGE3

1.0 Heading: DRY BULB TEMP. (DEG. F)

LONG SEASON DATA SPECIFICATIONS

2.1 First long season station name: NINEMILE R.S.

2.2 Second long season station name: POWELL R.S.

Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
54	70	05	02	10	02
2.3	2.4	2.5	2.6	2.7	2.8

SHORT PERIOD DATA SPECIFICATIONS

3.1 First long station name (short record period): NINEMILE R.S.

3.2 Second long station name (short record period): POWELL R.S.

3.3 Primary short-term station name: LOLO R.S.

Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
54	67	07	01	09	01
3.4	3.5	3.6	3.7	3.8	3.9

MEAN VALUES

	Long-term means (sequence 2)		Short-term means (sequence 3)			
Period	Long 1	Long 2	Period	Short 1	Short 1	Short 2
MAY 11	63.0	60.9	JUL 1	77.7	76.3	74.6
MAY 21	65.4	63.3	JUL 11	83.5	82.2	80.7
JUN 1	68.2	66.8	JUL 21	84.9	82.7	81.9
JUN 11	70.0	69.8	AUG 1	82.8	81.4	80.0
JUN 21	72.3	70.6	AUG 11	83.3	80.9	79.8
JUL 1	78.4	77.4	AUG 21	75.4	72.8	72.1
JUL 11	82.7	81.7	SEP 1	74.4	72.2	71.4
JUL 21	84.4	82.5				
AUG 1	82.9	81.4				
AUG 11	82.3	80.0				
AUG 21	76.5	74.2				
SEP 1	74.2	72.3				
SEP 11	67.5	64.0				
SEP 21	65.3	61.4				
OCT 1	59.1	55.1				
OCT 11	54.4	50.0				

[1] 10-day period within each month. Enter 01 for days 1-10, 02 for days 11-20, and 03 for days 21-31.

Exhibit 29.—Completed user worksheet and program request for the Program AVERAGE3 example used to generate output in exhibit 27.

REFERENCES

Finklin, Arnold I. Techniques for summarizing climatic data for land managers. General Technical Report INT-148. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1983. 43 p.

Furman, R. William; Brink, Glen E. The National Fire Weather Data Library: what it is and how to use it. General Technical Report RM-19. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 1975. 8 p.

Haines, Donald A. Where to find weather and climatic data for forest research studies and management planning. General Technical Report NC-27. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1977. 15 p.

APPENDIX A: HOW TO OBTAIN A DATA FILE FROM THE NATIONAL FIRE WEATHER DATA LIBRARY

Creation of a Data File for Use in the Climatology Programs

Three items of information are needed to obtain data from the NFDWL. They are (1) the 6-digit code (or codes) of the fire weather station(s) to be analyzed, (2) the years of data to be analyzed, and (3) the file name containing the **lowest** station code in the analysis. For example, if the stations to be analyzed are 034567, 245789, and 003452, only the file name that contains station 003452 is needed.

OBTAINING A FILE NAME

A current listing of files and stations within the files may be obtained by executing the following sequence at FCCC:

```
          1         2         3         4
1234567890123456789012345678901234567890
@RUN,ID,ACCOUNT,QUALIFIER
@ASG,A FIREDATALIB*PROGRAMS.
@XQT FIREDATALIB*PROGRAMS.LISTFILES
@FIN
```

NFDWL software creates a listing of file names and stations in the file. The general format follows (note: ssssss represents the 6-digit station code, and yy represents the last 2 digits of the year that data begins (FROM) or ends (THROUGH); nn, mm, and oo represent assorted numbers and letters of the file names).

FILE NAME	STATION YEAR LIMITS FROM	THROUGH	DATE OF LAST UPDATE
FIREDATALIB*nn-mm	ssssssyy	ssssssyy	mmddyy
FIREDATALIB*oo	ssssssyy	ssssssyy	mmddyy

etc.

Scan the "station year limits" column until the group containing the lowest 6-digit station code of station to be analyzed is found. The entire file name (FIREDATALIB*nn-mm) is to be used in place of "FILE" in the following data acquisition sequence.

CREATING A WEATHER RECORD IMAGE FILE FOR USE IN ANALYSIS

In creating a weather record image file, it is wise to generate a user program file of the data. This allows the data file to be stored in the Mass File Directory at FCCC for 6 days from the date of creation, allowing subsequent runs to access the data without re-creation of the data file by NFDWL software. This is particularly helpful in the event of input errors resulting in job termination prior to completion or when several programs will be run on the same data set.

This process is accomplished by executing the following sequence at FCCC. Again, ssssss is a 6-digit station code, and yy values are beginning and ending years of data inclusion, respectively. If all available years are requested, use yy=00 and yy=99.

```
          1         2         3         4         5         6
1234567890123456789012345678901234567890123456789012345678901234567890
@RUN
@ASG,A  FIREDATALIB*PROGRAMS.
@ASG,A  "FILE".
@USE  2.,  "FILE".
@ASG,UP  NAME.        (Name may be any meaningful name to user)
@USE  15.,NAME.       (See NAME)
@XQT  FIREDATALIB*PROGRAMS..GETDATA2
      ssssssyy   ssssssyy
      etc., until all stations are listed in ascending order
@EOF
1234567890123456789012345678901234567890123456789012345678901234567890
          1         2         3         4         5         6
```

The above sequence will create a data file on logical unit 15 to be analyzed by the climatology programs. NFDWL software will list the station number(s) and the number of the card images for each station. Subsequent runs of the same program, or other climatology programs within the next 6 days, would use the following sequence to access data for analysis.

```
          1         2
12345678901234567890
@RUN
@ASG,A  NAME.
@USE  15.,NAME.
```

Data Format of Parameters Accessed by Climatology Programs from the National Fire Weather Library

Record space(s) (inclusive)	Parameter, input format
1 — 6	Station number (I6)
7 — 8	Year (I2)
9 — 10	Month (I2)
11 — 12	Day (I2)
14 — 16	Dry bulb temperature (A3)
17 — 19	Humidity value (A3)
28 — 28	Wind direction (I1)
29 — 31	Windspeed (I3)
39 — 41	Period maximum temperature (A3)
42 — 44	Period minimum temperature (A3)
54 — 57	Precipitation amount (A4)
61 — 61	Moisture variable index: Defines humidity variable in columns 17 — 19 1 = Wet bulb temperature 2 = Relative humidity 3 = Dewpoint temperature

APPENDIX B: CLIMATOLOGY PROGRAM REQUEST AND USER WORKSHEETS

Climatology Program Request
Sheet Number 1

USER WORKSHEET: Programs SUMMARY, PRECIP1
PRECIP2, WINDS, and THREEWAY

Charge Number:_____ Date:_____

User:_____

Project:_____

Station Name[1]:_____ Number_____

Station Elevation:_____ft. NFWDL File Name[2]:_____

Year Begin_____ Year End_____

Program request and description of desired data base[3]:

	SUMMARY	PRECIP1	PRECIP2	WINDS	THREEWAY[4]
Date begin: (MMDDYY)[5]	_____	_____	_____	_____	_____
Date end: (MMDDYY)[5]	_____	_____	_____	_____	_____
Minimum days/ 10-day period	_____ (6 is default)		_____ (8 is default)		
Output level[6] (0 is default)				_____	_____

If SUMMARY:	Parameter(s) to be summarized[7]	Table(s) to be printed out[8]
____	Dry bulb temperature	1 2 3 4 5
____	Maximum daily temperature	1 2 3 4 5
____	Minimum daily temperature	1 2 3 4 5
____	Mean daily temperature	1 2 3 4 5
____	Relative humidity	1 2 3 4 5
____	Maximum relative humidity	1 2 3 4 5
____	Minimum relative humidity	1 2 3 4 5
____	Mean relative humidity	1 2 3 4 5

[1]20 character limit.
[2]Refer to "The National Fire Weather Data Library: What it is and how to use it" by R. William Furman and Glen E. Brink, USDA Forest Service Gen. Tech. Rep. RM-19, Rocky Mountain Forest and Range Experiment Station. Ft. Collins, CO 80521. 1975. 8 p.
[3]Indicate programs to be run by entering desired begin and end dates of desired data base under appropriate program name.
[4]Maximum of 5 months per execution.
[5]Enter dates in form of MM (month) DD (day) and YY (year), for example: 050962 (May 9, 1962).
[6]0 = 10 day and monthly totals; 1 = monthly tables only.
[7]Check (✓) parameters to be summarized.
[8]Circle desired output.

Climatology Program Request and
User Worksheet Number 2

PROGRAM AVERAGE1

Temperature or Humidity Variable to be Summarized:_____

Complete Record Station Name:_____

Incomplete Record Station Name:_____

DATA BASE DESCRIPTION:

	Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
Complete station	_____	_____	_____	_____	_____	_____
Incomplete station	_____	_____	_____	_____	_____	_____

10-DAY AND MONTHLY MEAN VALUES[2]:

Period	Incomplete station	Complete station	Period (con.)	Incomplete (con.)	Complete (con.)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

[1] 10-day period within each month. Enter 01 for days 1-10, 02 for days 11-20, and 03 for days 21-31.

[2] Enter 0 if data is missing. Enter all 10-day periods and their monthly mean values, in sequence.

Climatology Program Request and
User Worksheet Number 3

Program AVERAGE2

1.0 Heading: _____

LONG TERM STATION SPECIFICATIONS

2.1 First long-term station name: _____

2.2 Second long-term station name: _____

2.3 Year begin: _____ 2.4 Year end: _____

2.5 Month begin: _____ 2.6 Month end: _____

SHORT TERM STATION SPECIFICATIONS

3.1 Short-term station name: _____

3.4 Year begin: _____ 3.5 Year end: _____

3.6 Month begin: _____ 3.7 Month end: _____

10-DAY PERIOD MEAN AMOUNTS

	Long-term means[1] (sequence 2)			Short-term means[1] (sequence 3)		
Period[2]	Long 1	Long 2	Period[2]	Short 1	Long 1	Long 2

[1] Enter 0 if missing.

[2] Enter period beginning date; May 1, May 11, etc.

Climatology Program Request and
User Worksheet Number 4

Program AVERAGE3

1.0 Heading: _____

LONG SEASON DATA SPECIFICATIONS

2.1 First long season station name: _____

2.2 Second long season station name: _____

Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
2.3	2.4	2.5	2.6	2.7	2.8

SHORT PERIOD DATA SPECIFICATIONS

3.1 First long station name (short record period): _____

3.2 Second long station name (short record period): _____

3.3 Primary short-term station name: _____

Year begin	Year end	Month begin	Period[1] begin	Month end	Period[1] end
3.4	3.5	3.6	3.7	3.8	3.9

MEAN VALUES

Long-term means (sequence 2)			Short-term means (sequence 3)			
Period	Long 1	Long 2	Period	Short 1	Short 1	Short 2

[1] 10-day period within each month. Enter 01 for days 1-10, 02 for days 11-20; and 03 for days 21-31.

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Bradshaw, Larry S.; Fischer, William C. Computer programs for summarizing climatic data stored in the National Fire Weather Data Library. General Technical Report INT-164. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station; 1984. 39 p.

Describes computer programs that facilitate obtaining climatological summaries of information stored in the National Fire Weather Data Library. Computer programs for enhancing reliability of data-deficient weather records are also described. Instructions for executing the programs are given.

KEYWORDS: climatology, fire weather stations, computer systems

The Intermountain Station, headquartered in Ogden, Utah, is one of eight regional experiment stations charged with providing scientific knowledge to help resource managers meet human needs and protect forest and range ecosystems.

The Intermountain Station includes the States of Montana, Idaho, Utah, Nevada, and western Wyoming. About 231 million acres, or 85 percent, of the land area in the Station territory are classified as forest and rangeland. These lands include grasslands, deserts, shrublands, alpine areas, and well-stocked forests. They supply fiber for forest industries; minerals for energy and industrial development; and water for domestic and industrial consumption. They also provide recreation opportunities for millions of visitors each year.

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